

Mathematics Teacher Education:
Innovations at Work
Guest Editor's Introduction

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This issue of *Issues in Teacher Education* explores the continuum of teacher education through the content vehicle of mathematics, thereby encapsulating the journal's focus on probing the education of teachers from initial preparation through on-going professional development. Given the federal and state-level emphasis on content knowledge, the absence of Highly Qualified mathematics teachers, and recent efforts to recruit teachers in mathematics (e.g., The National Academies, 2007), this special issue is timely and of great importance to our readers.

Expectations and ideals endorsed by current reform efforts in mathematics education (e.g., NCTM, 2000) challenge teachers in their thinking about mathematics teaching and learning. Teachers are asked to teach in ways that promote an integrated, connected view of mathematics, rather than a procedural, rule-based view. Research suggests that some teachers, particularly at the elementary level, lack crucial mathematical understandings and conceptions needed to support this approach to mathematics teaching, particularly when faced with implementing new curricula. Although this climate provides an exciting opportunity for mathematics teacher educators of both *content* and *pedagogy*, there is not a clear path as to how to integrate these two historically separate facets of teacher education to facilitate prospective teacher learning, as well as structure teacher education and

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professional development programs and supporting curricula. Students sometimes leave their teacher education programs with the same preconceived notions about content, teaching, and learning as when they enter, suggesting that new models and approaches that promote long-term change are needed.

At the level of initial teacher preparation, one such model implemented at San Diego State University that is “Motivating Prospective Elementary School Teachers To Learn Mathematics by Focusing upon Children’s Mathematical Thinking” is shared by Randolph A. Philipp. In a specially designed, required course that accompanies a mathematics course on whole and rational number operations, prospective teachers look at mathematics through the lens of children’s mathematical thinking by analyzing student work, solving mathematics problems themselves, and viewing video where children explain their problem solving and solutions. Philipp outlines principles that support the course, suggestions for how to implement such an approach, and research that supports its effectiveness in developing prospective teachers’ beliefs and content knowledge.

With a similar goal of ascertaining more about how to support teacher learning, as well as the practice of teaching, Miriam Gamoran Sherin, Romary Russ, Bruce L. Sherin, and Adam Colestock are examining the viability of using a small video camera as a tool for studying what teachers notice and why they value these moments in facilitating student learning in the classroom. In “Professional Vision in Action: An Exploratory Study,” the authors carefully explicate findings from one high school mathematics teacher’s experiences utilizing the technological device during instruction. This teacher’s observations, coupled with his reflection on choices made during select moments, reveal how powerful utilizing such a device can be for both a teacher’s professional development and teacher educators’ ability to understand teacher decision-making in the field.

Also maximizing the power of today’s technology to facilitate teacher development are Katherine A. Morris and Joan Easterday, who, in “Amplifying Autonomy and Collective Conversation: Using Video iPods™ To Support Mathematics Teacher Learning,” present a case study in which personal video players were employed to help teachers improve their teaching of algebraic thinking to middle grades (5-9) English Language Learners. The aim of the multi-year, professional development project was to help teachers learn how to facilitate classroom discussions in which *all* students have opportunities to make conjectures, justify their reasoning, evaluate problem solving strategies, and move towards generalizations and proof, as recommended by current reform. Equipped with handheld devices that contained audio and video resources that they

could access when convenient to schedule and location, teachers were able to expand their ability to both sustain and initiate more in-depth discussion with colleagues than would otherwise have been possible.

Babette M. Benken and Nancy Brown also examined teacher learning within a professional development context. In “Moving Beyond the Barriers: A Re-defined, Multi-leveled Partnership Approach to Mathematics Teacher Education,” they propose a model of professional development that envelops multiple levels of learner (prospective elementary teachers through teacher educators), context, and a curriculum that integrates pedagogical, mathematical content, and pedagogical content knowledge. Parallel research of an on-site, long term effort grounded on this model suggests that the multiple layers of constituents within the mathematics community became a particularly salient feature in generating growth and success toward community goals. A second advancement in learning is evident in the nature of the discussion facilitated by faculty from both a school of education and department of mathematics. This community centered on learning and the interplay between the mathematical concepts taught and the views of mathematics embedded within each individual teacher’s practice, as they existed within this under-performing, urban setting.

Moving out to yet a broader look at teacher development, Jennifer B. Chauvot examines “Curricular Knowledge and the Work of Mathematics Teacher Educator-Researchers” through a theoretical synthesis of existing literature that expands our understanding of the diversity of roles that exist for educator-researchers and the types of experiences that can facilitate growth in many dimensions of knowledge. Throughout her analysis she adopts the notion of *layers*, which she applies to types of knowledge, complexity of educator-researchers’ work, and level of construct. The labor of a mathematics teacher educator is conceptually different from that of a mathematics teacher. As the two professions inform each other, she posits that we can apply what we learn as educator-researchers for constructing a better understanding of the professional development of mathematics teachers. To capitalize upon her words, as mathematics teacher educator-researchers study themselves in transition, they have the potential for better understanding teachers in transition.

Given the national focus on teacher accountability and current mandates (e.g., No Child Left Behind, 2001) that place emphasis on content knowledge, schools of education must approach teacher education in creative ways, while concurrently placing focus on content knowledge and research-based pedagogy. As Lappan and Rivette (2004) note, “For many reasons, not the least of which is the rapidly changing world in which we live, there is no clear choice for mathematics teacher

educators” (p. 1). This special issue provides teacher educators with a resource of ideas for how to envision change and implement alternatives that work, with examples representing all stages of teacher learning from forward thinkers in the field who believe in embracing the reality of practice.

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